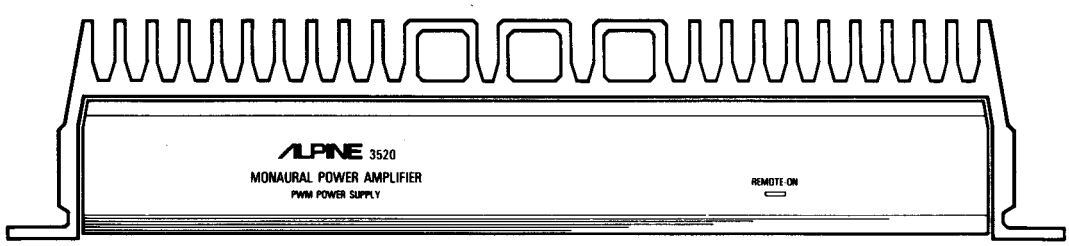
ALPINE SERVICE MANUAL

MONAURAL

POWER AMPLIFIER



3520

Contents

Specifications 3
Parts Locations and Disassembly Instructions ..... 4 to 5
Adjustment Procedures 6
Adjustment Locations 7
Block Diagram 8
Schematic Diagram ..... 9 to 10
Wiring Diagram and Parts Layout on P.C. Board ..... 11 to 12
Electrical Parts List ..... 13 to 16
Exploded View ..... 17 to 18
Cabinet Parts List 19
Packing Method View 20
Packing Parts List 21
Semiconductors Lead Identifications ..... 22 to 23

Specifications

Power Output (1 kHz, 10% THD)	130 W/CH
Rated Power Output (20 Hz ~ 20 kHz, 0.1% THD)	60 W/CH
Input Sensitivity (Rated Power Output)	500 mV ± 20%
Input Impedance	10K ohms ± 20%
Frequency Response (−1 dB at 1 W Output)	20 Hz to 20 kHz
Current Drain (Rated Power Output)	25 A
Speaker Impedance	4 ohms
Signal to Noise Ratio (1 kHz)	96 dB
Fuse Requirement	20 A
Power Source	14.4 V DC
Semiconductors	3 ICs, 28 Transistors, 14 Diodes, 6 Zener Diodes
Dimensions (WxHxD)	240 x 55 x 160 mm
Weight	2.2 kg

Parts Locations and Disassembly Instructions

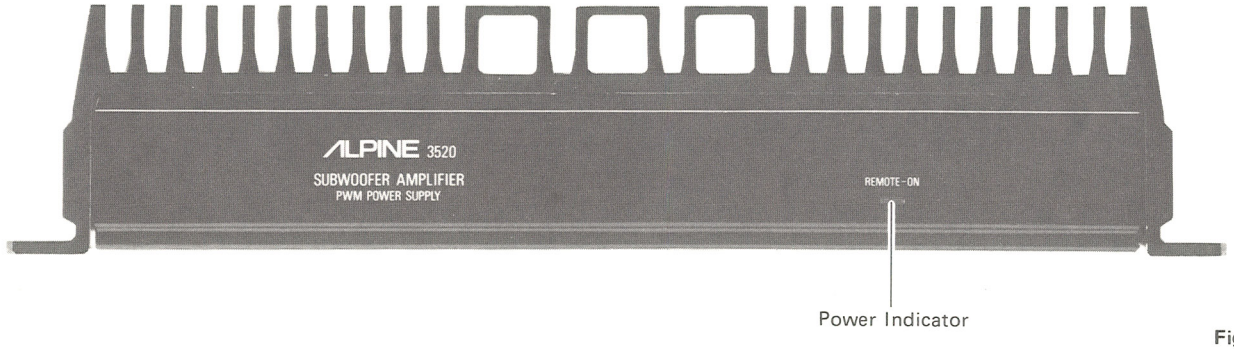


Figure 1

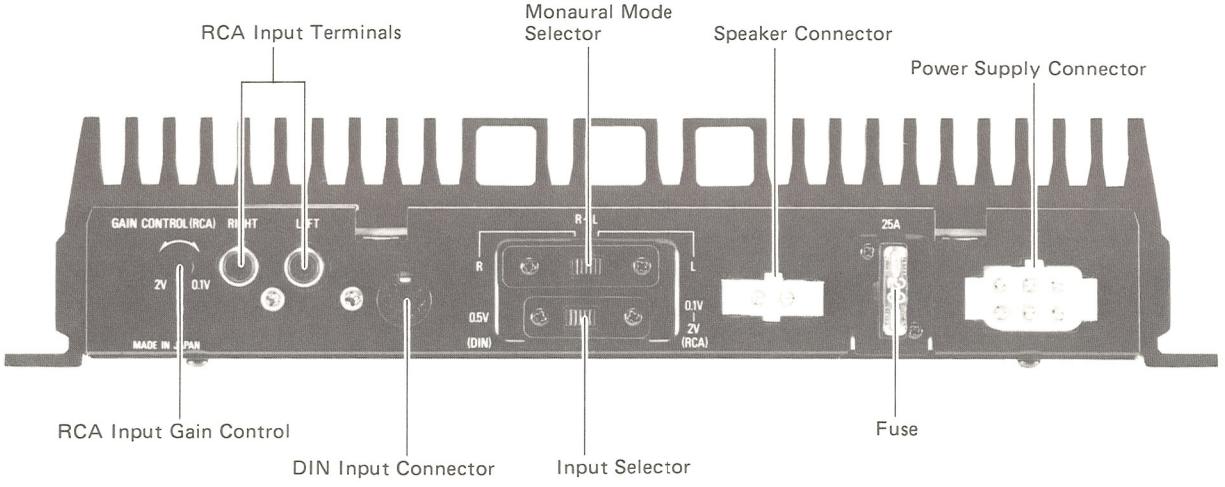


Figure 2

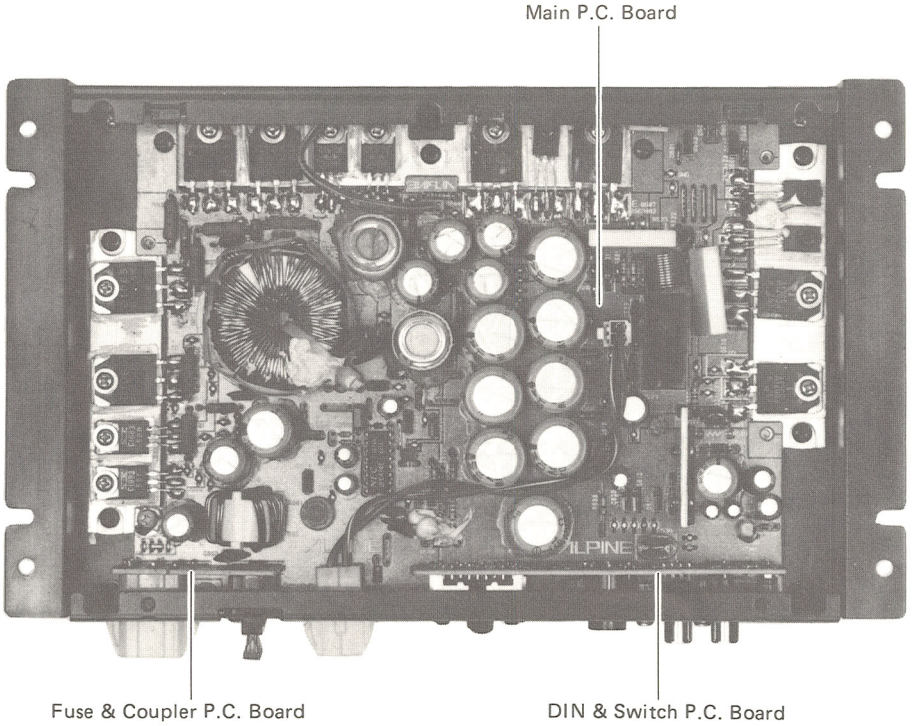


Figure 3

1. Removal of Bottom Cover

(1) Remove two screws marked "○" as shown in Figure 4.

2. Removal of Heat Sink, Front Chassis and LED P.C. Board

(1) After removal of bottom cover, remove eleven screws marked "□" as shown in Figure 5.
(2) Disconnect the connector from LED P.C. Board.
(3) Remove heat sink with front chassis and LED P.C. Board.

3. Removal of Fuse & Coupler P.C. Board and DIN & Switch P.C. Board

(1) After removal of bottom cover and heat sink, remove two screws marked "☆" in Figure 6.
(2) Remove eight screws marked "△" in Figure 4.
(3) Remove solder (a, b) of fuse & coupler P.C. Board and DIN & switch Board.
(4) Disconnect two connectors from there P.C. Board.
(5) Fuse & Coupler P.C. Board, DIN & Switch P.C. Board with Rear Cover can be removed completely.

4. Removal Main P.C. Board

(1) After removal of fuse & coupler P.C. Board and DIN & switch P.C. Board, remove solder (c ~ f) as shown in Figure 7.
(2) Remove four screws marked "■" in Figure 7.

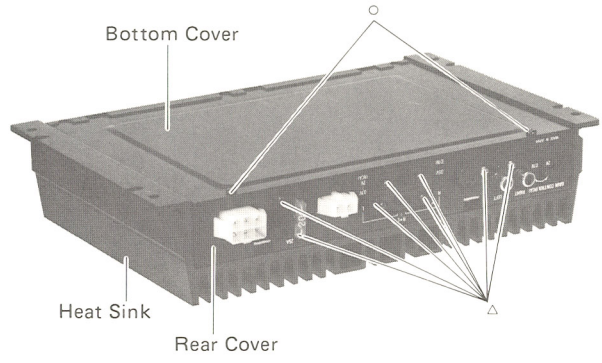


Figure 4

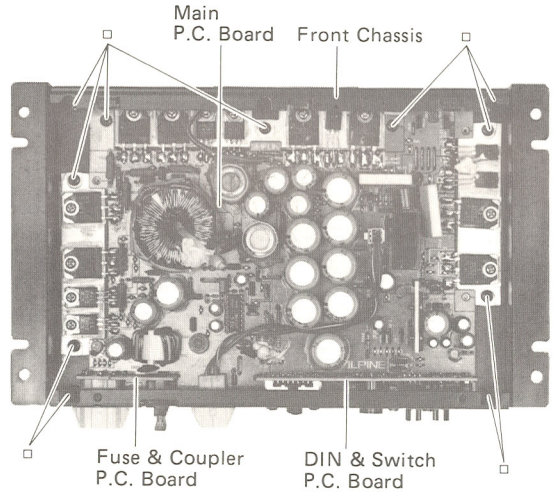


Figure 5

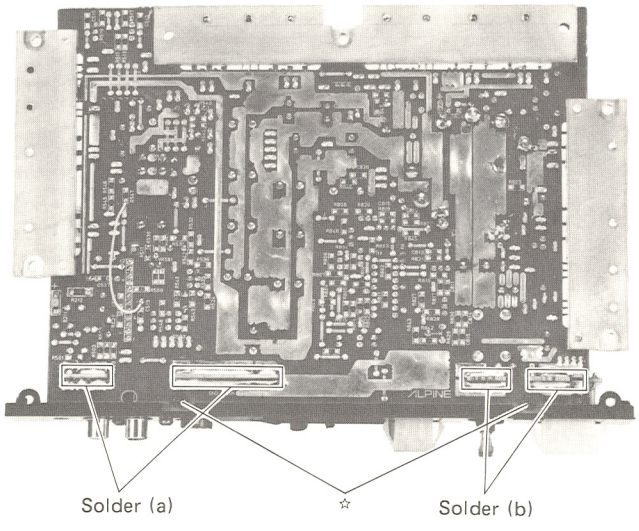


Figure 6

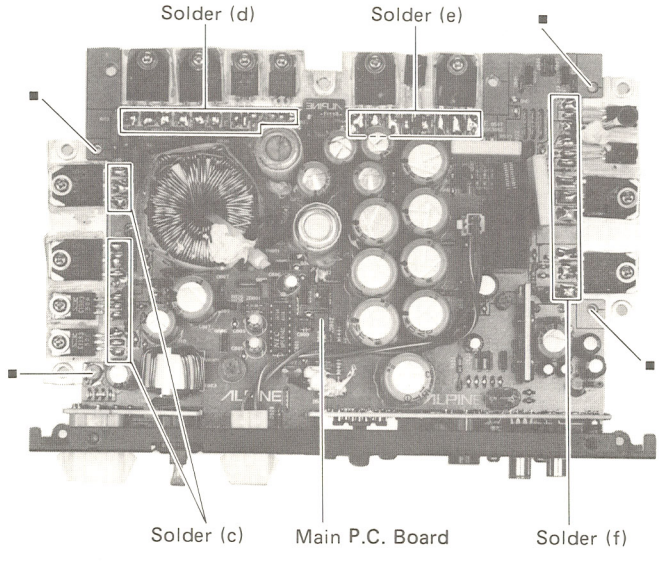


Figure 7

Adjustment Procedures

- **Power Supply Voltage Adjustment**

(1) Connections

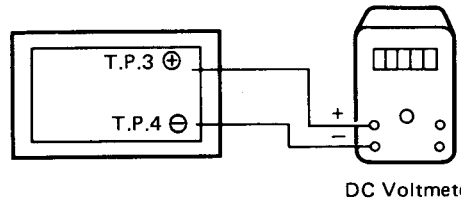


Figure 8

(2) Adjustment Procedures

Adjust solid-state variable resistor VR801 to obtain 75 ± 0.5 V (between T.P. 3 and T.P. 4) on the DC voltmeter.

- **Idle Current Adjustment**

(1) Connections

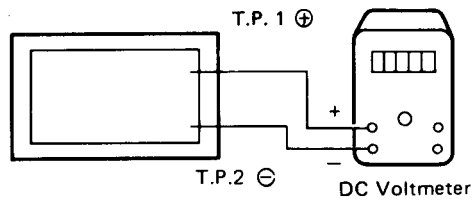


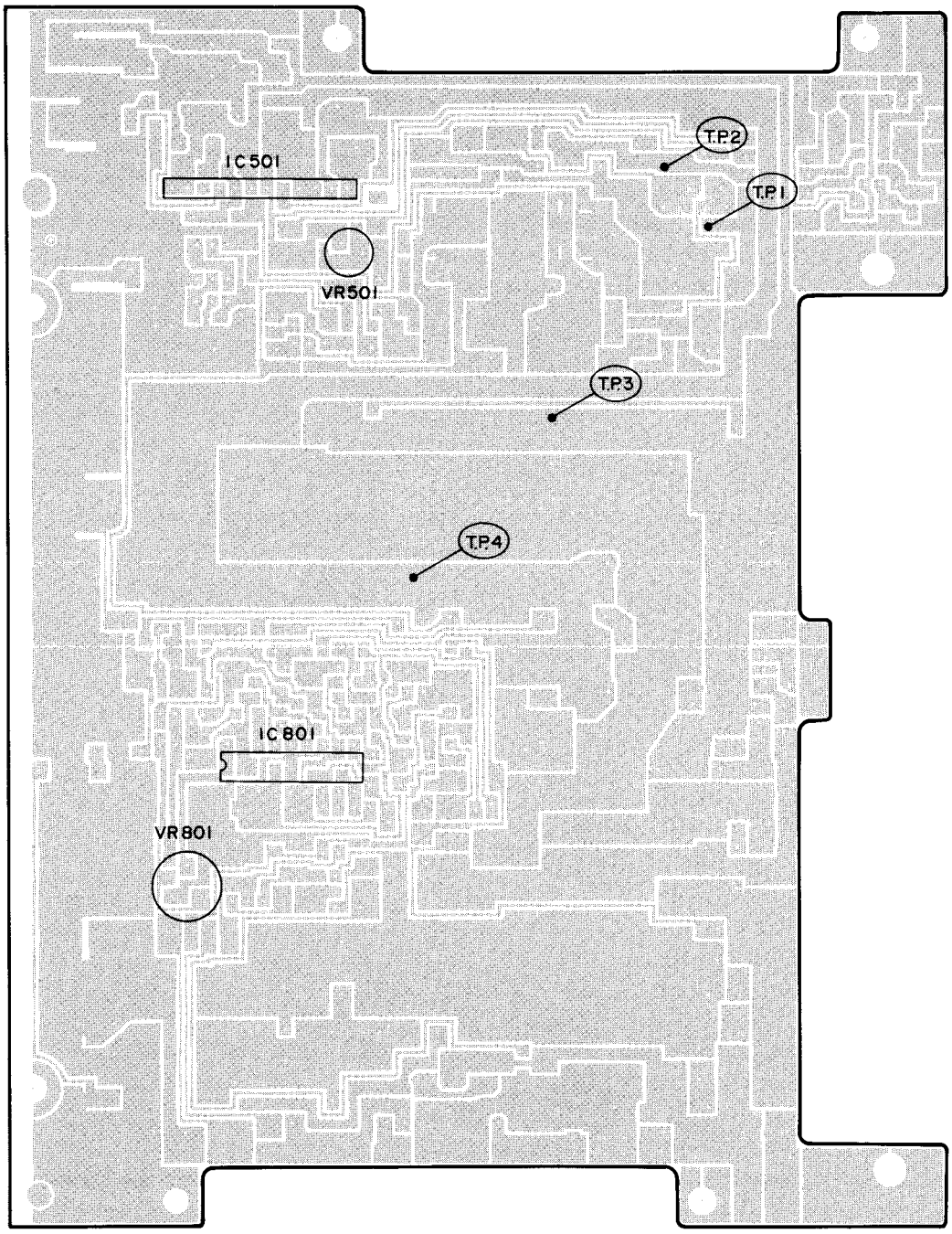
Figure 9

(2) Adjustment Procedures

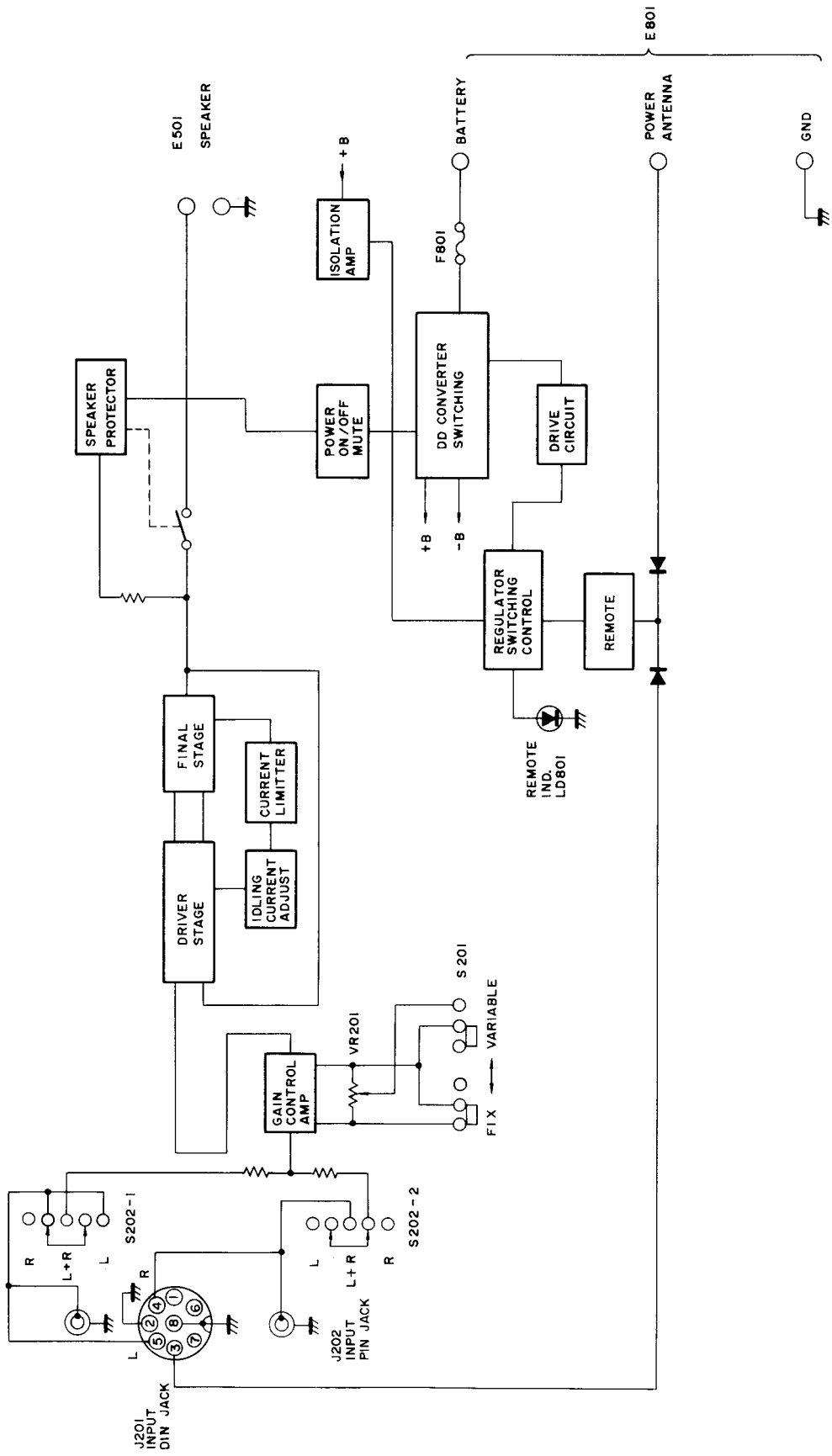
Adjust the solid-state variable resistor VR501 to obtain 25 ± 1.0 mV (between T.P. 1 and T.P. 2) on the DC voltmeter.

- Idler current = 25 ± 1.0 (mV) ÷ 0.2 (ohm) = 125 ± 5.0 (mA)

Adjustment Locations



Block Diagram

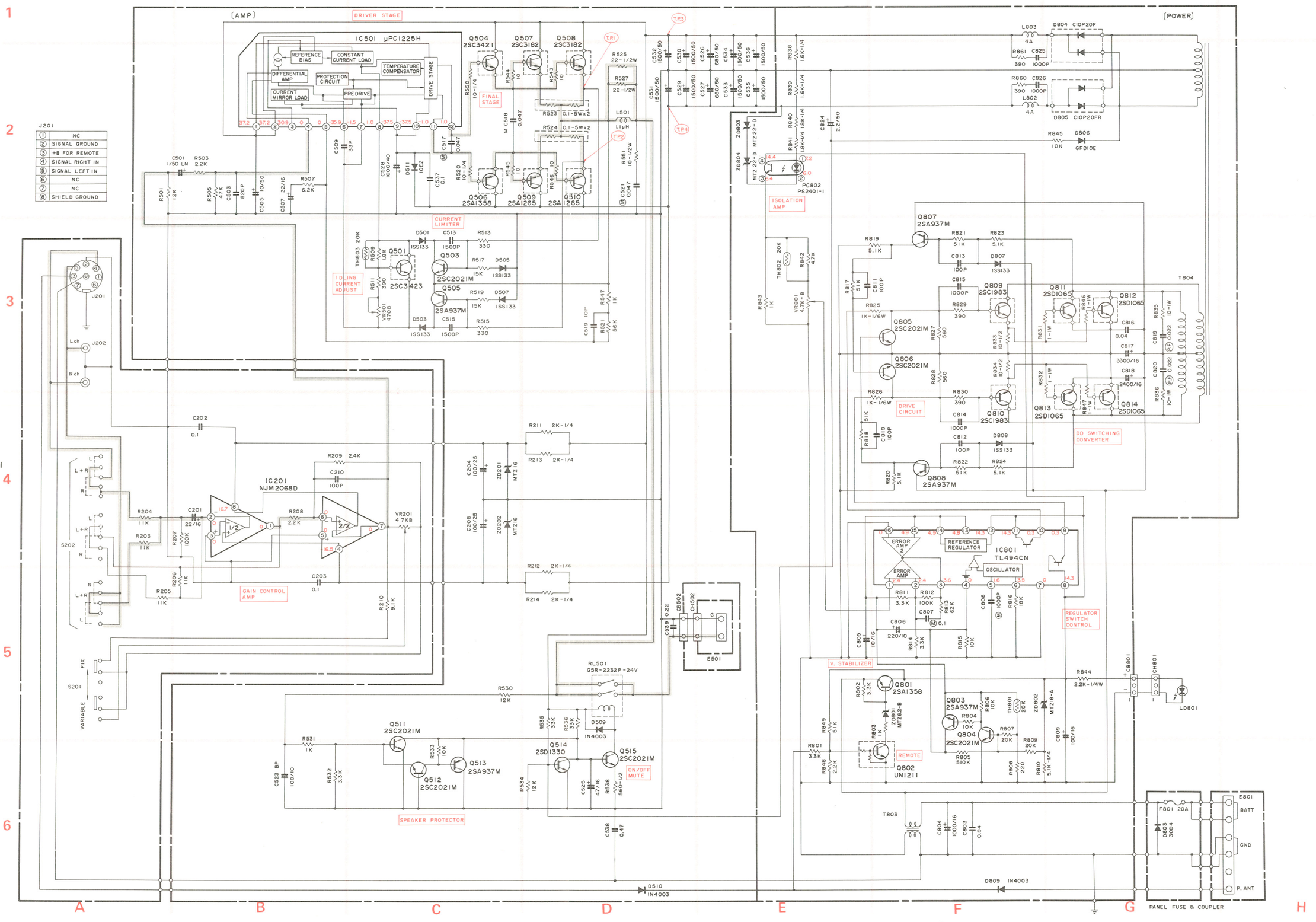


Schematic Diagram

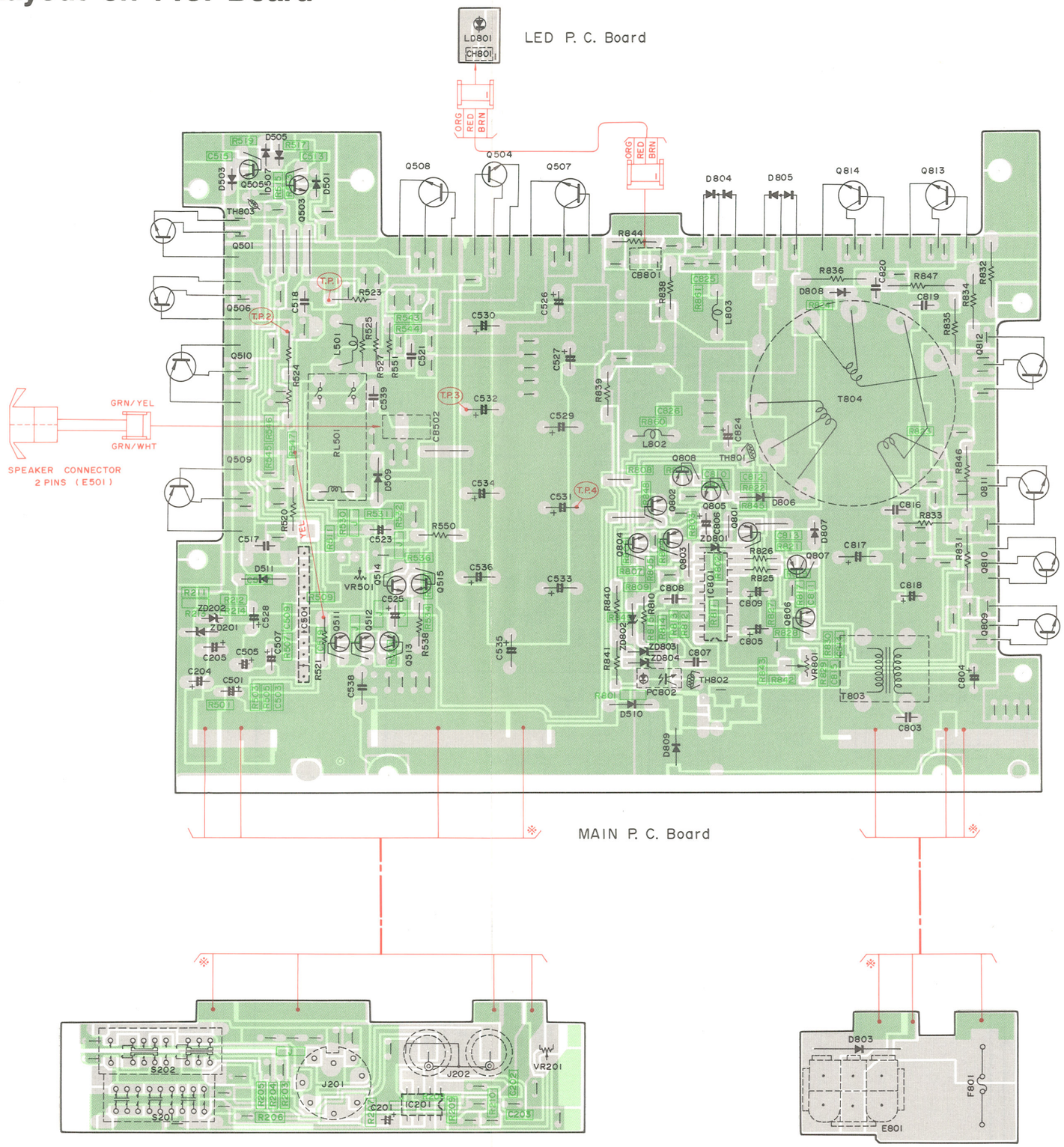
ICs	IC201 IC501 PC802 IC801
Transisitors	Q501 Q503 Q505 Q504 Q511–Q513 Q506–Q510 Q514 Q515 Q805–Q808 Q801–Q804 Q809–Q814
Diodes	D511 D501 D503 D505 D507 ZD201–ZD202 D509 D510 ZD803–ZD804 ZD801 D807–D808 D809 ZD802 D804–D806 D803 LD801

	B	C	E
Q501	–1.0	1.0	–1.5
Q503	0	–1.3	0
Q504	1.0	37.2	0.4
Q505	0	0.8	0
Q506	–1.0	–38.1	–0.5
Q507	0.4	37.2	0
Q508	0.4	37.2	0
Q509	–0.5	–38.1	0
Q510	–0.5	–38.1	0
Q511	0	12.2	0
Q512	0	12.2	0
Q513	12.2	0	12.2
Q514	–2.4	12.2	0
Q515	12.2	11.5	11.4
Q801	13.7	14.3	14.4
Q802	5.2	0	0
Q803	4.9	0	4.9
Q804	0	4.9	0
Q805	–0.2	0	0
Q806	–0.3	0	0
Q807	14.8	6.9	14.4
Q808	14.9	7.2	14.4
Q809	0	14.4	0
Q810	0	14.4	0
Q811	0	14.4	0
Q812	0	14.4	0
Q813	0	14.4	0
Q814	0	14.4	0

Voltage measuring conditions
Power Supply voltage 14.4V DC
Measuring instrument Digital Multimeter
Measuring point reference
With respect to the primary ground potential (POWER)
With respect to the secondary ground potential (AMPLIFIER)
Measuring conditions No signal input
Unit's load 4Ω
SW settings
Input selector to 0.5V position
Monaural mode selector to RIGHT + LEFT position



Wiring Diagram and Parts Layout on P.C. Board



Electrical Parts List

Resistors: Carbon resistors under 1/4 watts are not mentioned in the parts list, please confirm them by schematic diagram.
uF = microfarads, pF = picofarad, CP = chip.

Symbol No.	Part No.	Description
	Main P.C. Board	
ICs		
IC801	51T71049F01	TL494CN
or	51T70759F01	uC494C
PC802	51T70760F01	Photo coupler PC2401
Transistors		
Q503	48T51091F01	2SC2021
Q505	48T63086F01	2SA937M
Q511	48T51091F01	2SC2021
Q512	48T51091F01	2SC2021
Q513	48T63086F01	2SA937M
Q514	48T57337F01	2SD1330
Q515	48T51091F01	2SC2021
Q801	48T69177F01	2SA1358
Q802	48T62540F01	UN1211
Q803	48T63086F01	2SA937M
Q804	48T51091F01	2SC2021
Q805	48T51091F01	2SC2021
Q806	48T51091F01	2SC2021
Q807	48T63086F01	2SA937M
Q808	48T63086F01	2SA937M
Diodes		
D501	48T58583F01	SS176
or	48T68828F01	1SS133
D503	48T58583F01	SS176
or	48T68828F01	1SS133
D505	48T58583F01	SS176
or	48T68828F01	1SS133
D507	48T58583F01	SS176
or	48T68828F01	1SS133
D509	48S40477U01	IN4003
D510	48S40477U01	IN4003
D511	48C40235G02	10E2
D806	48T58593F01	GFD 10
D807	48T58583F01	SS176
or	48T68828F01	1SS133
D808	48T58583F01	SS176
or	48T68828F01	1SS133
D809	48S40477U01	IN4003
ZD201	48T68697F55	Zener, HZS 16EB2
or	48T68699F48	Zener, MTZ 16-C
ZD202	48T68697F55	Zener, HZS 16EB2
or	48T68699F48	Zener, MTZ 16-C
ZD801	48T68697F24	Zener, HZS6.2EB2
or	48T68699F16	Zener, MTZ 6.2-B
ZD802	48T68697F57	Zener, HZS 18EB1
or	48T68699F49	Zener, MTZ 18-A
ZD803	48T68697F66	Zener, HZS 22EB3
or	48T68699F59	Zener, MTZ 22-D
ZD804	48T68697F66	Zener, HZS 22EB3
or	48T68699F59	Zener, MTZ 22-D
Thermistors		
TH802	48T60670F01	20K ohms
TH803	48T60670F01	20K ohms
Coils		
L501	24T74372F01	Inductor, 1.1uH
L802	25T58607F01	Choke, 4A
L803	25T58607F01	Choke, 4A
T803	25T70842F01	Choke, Common 3520

Symbol No.	Part No.	Description
Volume Controls		
VR501	18T42748F05	470 ohms 1/2W
VR801	18B44064J02	4.7K ohms 1/2W
Relay		
RL501	80T70844F02	G5R-2232P-24V
Capacitors		
C204	23S40657F21	Electrolytic 100pF 25V
C205	23S40657F21	Electrolytic 100pF 25V
C501	23T42478F24	Electrolytic 1uF 50V
C503	08S53332F34	CP. 820pF
C505	23T61513F34	Electrolytic 10uF 50V
C507	23S40657F11	Electrolytic 22uF 16V
C509	08S53332F17	CP. 33pF
C513	08S53332F37	CP. 1500pF
C515	08S53332F37	CP. 1500pF
C517	08T57705F75	Mylar 0.047uF
C518	08T57705F75	Mylar 0.047uF
C519	08S53332F11	CP. 10pF
C521	08T57705F75	Mylar 0.047uF
C523	23S41192U68	Electrolytic (BP) 100uF 10V
C525	23S40657F13	Electrolytic 47uF 16V
C526	23T69238F03	Electrolytic 680uF 50V
C527	23T69238F03	Electrolytic 680uF 50V
C528	23T69238F05	Electrolytic 1000uF 40V
C529	23T69238F04	Electrolytic 1500uF 50V
C530	23T69238F04	Electrolytic 1500uF 50V

Symbol No.	Part No.	Description
C531	23T69238F04	Electrolytic 1500uF 50V
C532	23T69238F04	Electrolytic 1500uF 50V
C533	23S69238F04	Electrolytic 1500uF 50V
C534	23T69238F04	Electrolytic 1500uF 50V
C535	23S69238F04	Electrolytic 1500uF 50V
C536	23T69238F04	Electrolytic (BP) 100uF 10V
C537	08S53332F57	CP. 0.1uF
C538	08T42629F37	Myler 0.47uF
C539	08T57851F17	TF. 0.22uF
C803	08S40805F22	Ceramic 0.04uF
C804	23T51232F02	Electrolytic 1000uF 16V
C805	23S40657F10	Electrolytic 10uF 16V
C806	23T65374F02	Electrolytic 220uF 10V
C807	08T57705F79	Mylar 0.1uF
C808	08T57705F55	Mylar 1000pF
C809	23T65374F05	Electrolytic 100uF 16V
C810	08S53332F23	CP. 100pF
C811	08S53332F23	CP. 100pF
C812	08S53332F23	CP. 100pF
C813	08S53332F23	CP. 100pF
C814	08S53332F35	CP. 1000pF
C815	08S53332F35	CP. 1000pF
C816	08S40805F22	Ceramic 0.04uF
C817	23C42170G37	Electrolytic 3300uF 16V
C818	23T69238F01	Electrolytic 2400uF 16V
C819	08T57851F05	TF. 0.022uF
C820	08T57851F05	TF. 0.022uF
C824	23S40657F29	Electrolytic 2.2uF 50V
C825	08S53332F35	CP. 1000pF
C826	08S53332F35	CP. 1000pF

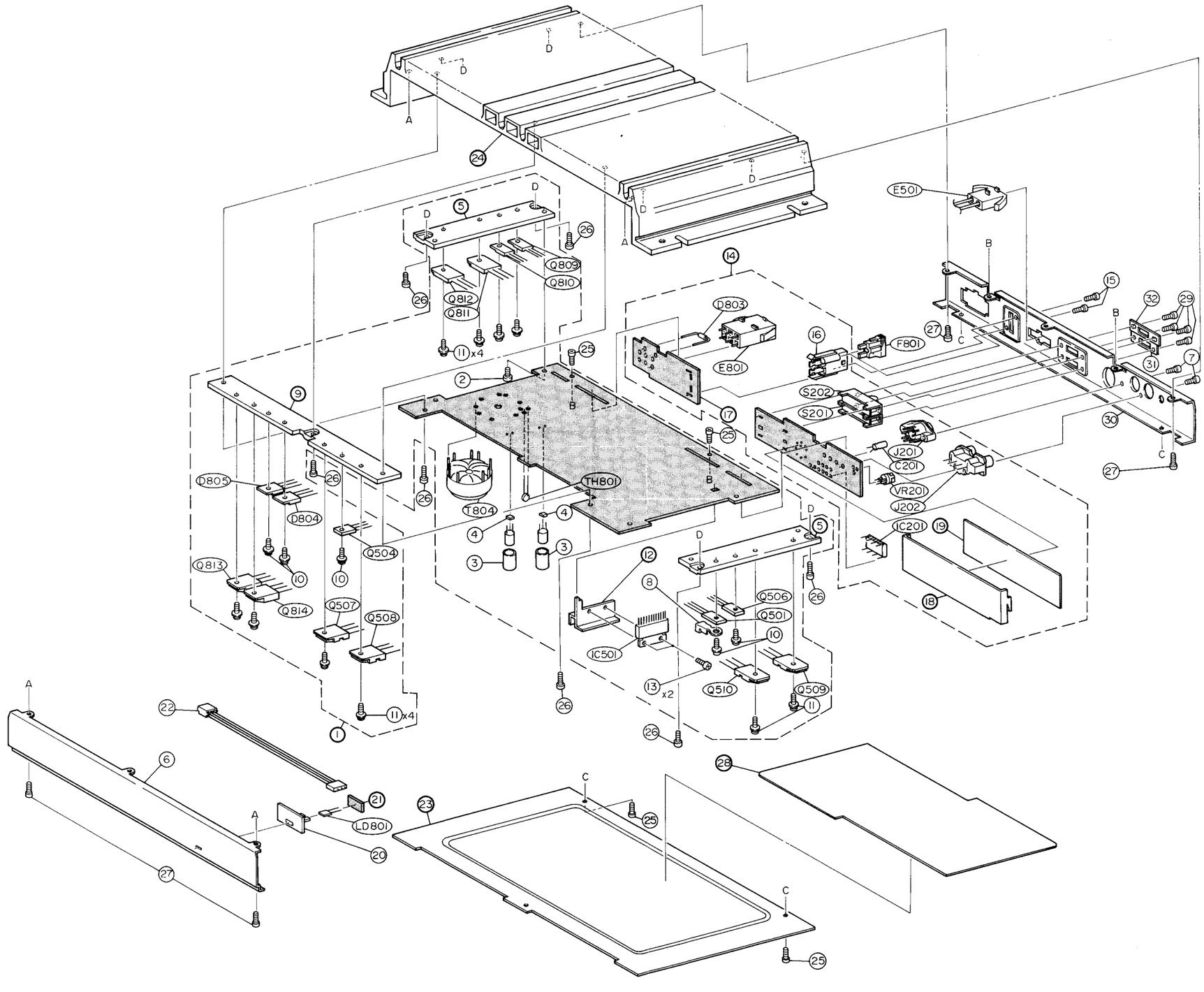
Symbol No.	Part No.	Description
Resistors		
R211	06T70072F60	CP. 2K ohms 1/8W
R212	06T70072F60	CP. 2K ohms 1/8W
R213	06T70072F60	CP. 2K ohms 1/8W
R214	06T70072F60	CP. 2K ohms 1/8W
R501	06S53330F79	CP. 12K ohms 1/8W
R503	06S53330F61	CP. 2.2K ohms 1/8W
R505	06S53330F93	CP. 47K ohms 1/8W
R507	06S53330F72	CP. 6.2K ohms 1/8W
R509	06S53330F59	CP. 1.8K ohms 1/8W
R511	06S53330F43	CP. 390 ohms 1/8W
R513	06S53330F41	CP. 330 ohms 1/8W
R515	06S53330F41	CP. 330 ohms 1/8W
R517	06S53330F81	CP. 15K ohms 1/8W
R519	06S53330F81	CP. 15K ohms 1/8W
R523	06T51107F02	Metal Plate 0.1 ohms 5W
R524	06T51107F02	Metal Plate 0.1 ohms 5W
R525	06T67581F12	Carbon Film 22 ohms 1/2W
R527	06T67581F12	Carbon Film 22 ohms 1/2W
R530	06S53330F79	CP. 12K ohms 1/8W
R531	06S53330F53	CP. 1K ohms 1/8W
R532	06S53330F65	CP. 3.3K ohms 1/8W
R533	06S53330F77	CP. 10K ohms 1/8W
R534	06S53330F79	CP. 12K ohms 1/8W
R535	06S53330F89	CP. 33K ohms 1/8W
R536	06S53330F89	CP. 33K ohms 1/8W
R538	06T67581F29	Carbon Film 560 ohms 1/2W
R543	06S53330F05	CP. 10 ohms 1/8W
R544	06S53330F05	CP. 10 ohms 1/8W
R545	06S53330F05	CP. 10 ohms 1/8W
R546	06S53330F05	CP. 10 ohms 1/8W
R547	06S53330F53	CP. 1K ohms 1/8W

Symbol No.	Part No.	Description
R551	06T67581F08	Carbon Film 10 ohms 1/2W
R801	06S53330F65	CP. 3.3K ohms 1/8W
R802	06S53330F65	CP. 3.3K ohms 1/8W
R803	06S53330F53	CP. 1K ohms 1/8W
R804	06S53330F77	CP. 10K ohms 1/8W
R805	06S53331F19	CP. 510K ohms 1/8W
R806	06S53330F77	CP. 10K ohms 1/8W
R807	06S53330F84	CP. 20K ohms 1/8W
R808	06S53330F37	CP. 220 ohms 1/8W
R809	06S53330F84	CP. 20K ohms 1/8W
R811	06S53330F65	CP. 3.3K ohms 1/8W
R812	06S53331F02	CP. 100K ohms 1/8W
R813	06S53330F96	CP. 62K ohms 1/8W
R814	06S53330F65	CP. 3.3K ohms 1/8W
R815	06S53330F77	CP. 10K ohms 1/8W
R816	06S53330F83	CP. 18K ohms 1/8W
R817	06S53330F94	CP. 51K ohms 1/8W
R818	06S53330F94	CP. 51K ohms 1/8W
R819	06S53330F70	CP. 5.1K ohms 1/8W
R820	06S53330F70	CP. 5.1K ohms 1/8W
R821	06S53330F94	CP. 51K ohms 1/8W
R822	06S53330F94	CP. 51K ohms 1/8W
R823	06S53330F70	CP. 5.1K ohms 1/8W
R824	06S53330F70	CP. 5.1K ohms 1/8W
R827	06S53330F47	CP. 560 ohms 1/8W
R828	06S53330F47	CP. 560 ohms 1/8W
R829	06S53330F43	CP. 390 ohms 1/8W
R830	06S53330F43	CP. 390 ohms 1/8W
R831	06T55178F07	Metal Film 1 ohm 1W
R832	06T55178F07	Metal Film 1 ohm 1W
R833	06T55175F17	Metal Film 10 ohms 1/2W
R834	06T55175F17	Metal Film 10 ohms 1/2W
R835	06T55177F17	Metal Film 10 ohms 1W

Symbol No.	Part No.	Description
R836	06T55177F17	Metal Film 10 ohms 1W
R842	06S53330F69	CP. 4.7K ohms 1/8W
R843	06S53330F53	CP. 1K ohms 1/8W
R845	06S53330F77	CP. 10K ohms 1/8W
R846	06T55178F07	Metal Film 1 ohms 1W
R847	06T55178F07	Metal Film 1 ohms 1W
R848	06S53330F61	CP. 2.2K ohms 1/8W
R849	06S53330F94	CP. 51K ohms 1/8W
R860	06S53330F43	CP. 390 ohms 1/8W
R861	06S53330F43	CP. 390 ohms 1/8W
DIN & Switch P. C. Board		
Capacitors		
C202	08S53332F57	CP. 0.1uF
C203	08S53332F57	CP. 0.1uF
C210	08S53332F23	CP. 100pF
Resisitors		
R203	06S53330F78	CP. 11K ohms 1/8W
R204	06S53330F78	CP. 11K ohms 1/8W
R205	06S53330F78	CP. 11K ohms 1/8W
R206	06S53330F78	CP. 11K ohms 1/8W
R207	06S53331F02	CP. 100K ohms 1/8W
R208	06S53330F61	CP. 2.2K ohms 1/8W
R209	06S53330F62	CP. 2.4K ohms 1/8W
R210	06S53330F76	CP. 9.1K ohms 1/8W
Miscellaneous		
ICs		
IC201	51T73087F01	NJM 2068D
IC501	51T58602F01	uPC 1225H
Transistors		
Q501	48T64376F01	2SC3423
Q504	48T69176F01	2SC3421
Q506	48T70761F01	2SA1358
Q507	48T58609F01	2SC3182
Q508	48T58609F01	2SC3182
Q509	48T58610F01	2SA1265
Q510	48T58610F01	2SA1265

Symbol No.	Part No.	Description
Q809	48T40469U01	2SC1983
Q810	48T40469U01	2SC1983
Q811	48T47613F01	2SD1065
Q812	48T47613F01	2SD1065
Q813	48T47613F01	2SD1065
Q814	48T47613F01	2SD1065
Diodes		
D803	48T68079F03	30D4
D804	48T71360F01	C10P20F
or	48T61597F01	CTG22S
D805	48T71360F02	C10P20FR
or	48T61597F02	CTG22R
LED		
LD801	48T52238F02	PR5552K (Red)
Switches		
S201	40T70757F01	Slide (Input selector)
S202	40T61593F01	Slide (Monaural Mode selector)
Transformer		
T804	25T73202F01	DC-DC Control
Others		
C201	23T57422F11	Capacitor, Electrolytic 22uF 16V
E501	01T72933F01	Speaker, Connector 2-pins
E801	01T70748F01	Power Supply, Connector 6-pins
F801	65T58596F06	Fuse, Auto 20A
J201	09T70752F01	Socket, Din 8-pins
J202	09T70753F01	Jack, RCA 2-pins
TH801	48T60670F01	Thermistor, 20K ohms
VR201	18T42748F17	Resistor, Volume 47K ohms

Exploded View (Cabinet)

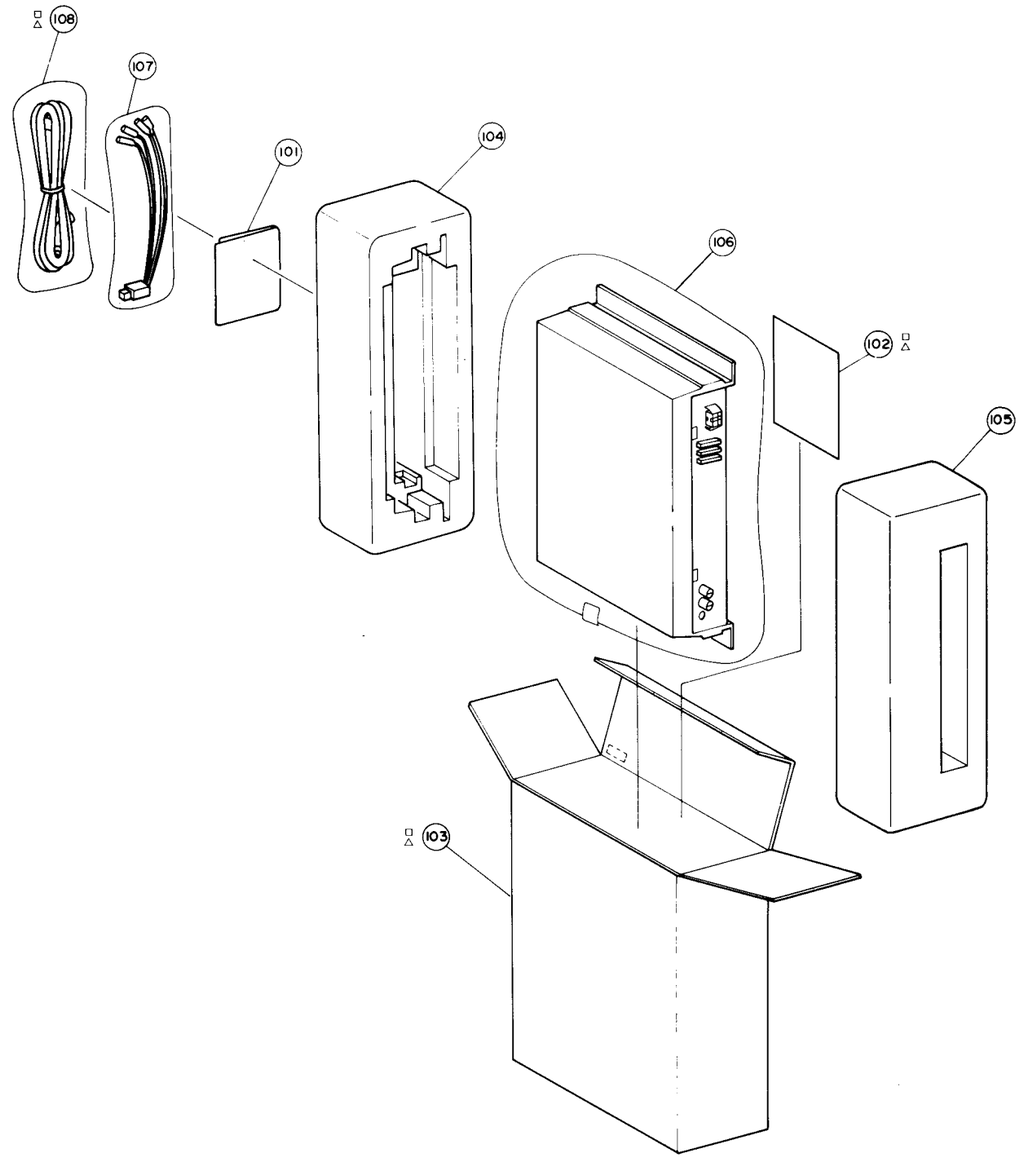


Cabinet Parts List

Sym-bol No.	Index	Part No.	Description
2		03S71031F07	Screw, Bind (M3x6)
3	4D	26A72624F01	Shield, Case
4	4D	75S72374F06	Cushion, Rubber
6	5B	27C70597F03	Chassis, Front
7		03S40012G41	Screw, Pan (M3x8)
8	4E	09T74442F01	Holder, Thermistor
10	4C	03S71252F04	Screw, W/Double Washer (M3x9) (Used when D804 and D805 are C10P20)
or	4C	03S71252F05	Screw, W/Double washer (M3x10) (Used when D804 and D805 are CTG22)
11	5C,5F	03S71252F05	Screw, W/Double washer (M3x10)
13		03S71031F08	Screw, Bind (M3x5)
15		03S68555F02	Screw, Pan (M2x5.5)
16	3F	09T70751F01	Holder, Auto Fuse 1-pin
20	6C	15B70599F01	Cover LED
22	5B	01D61220F91	Assy., Connector 3 pins
25		03S44205G04	Screw, Pan (M3x5)
26		03S63857F39	Screw, Bind (M3x12)
27		03S63857F36	Screw, Pan (M3x6)
29		03S43997P51	Screw, Round (M2.6x4)
30	3G	27C72817F01	Chassis, Rear
31	3G	14A70605F01	Insulator, Switch Lock
32	3G	14A72818F01	Insulator, Switch Lock

NOTE: The parts without part number are not supplied.

Packing Method View



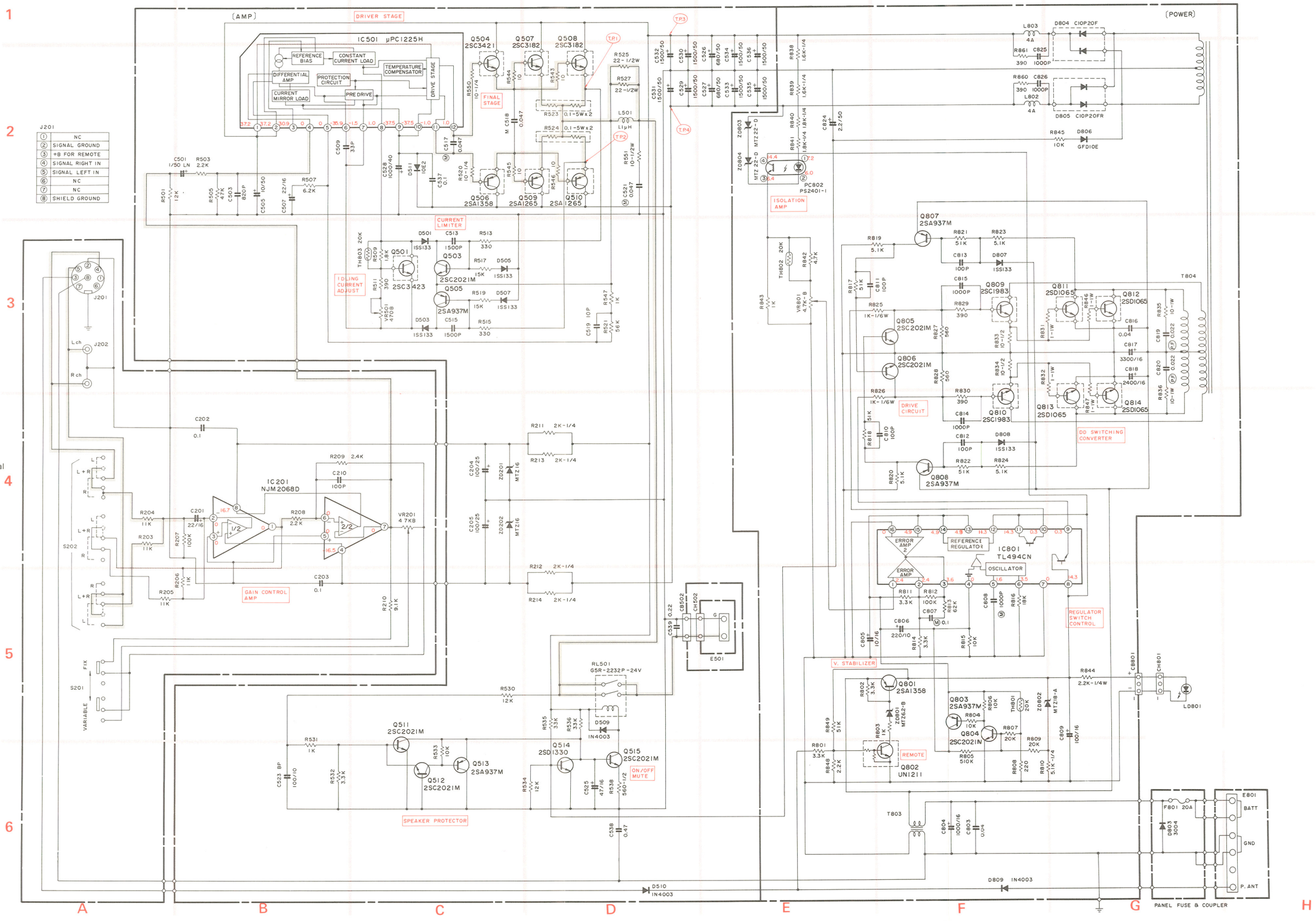
□ : For North American Model only (AO)
△ : For General Foreign Model only (GO)
Others: common

Schematic Diagram

ICs	IC201 IC501 PC802 IC801
Transisitors	Q501 Q503 Q505 Q504 Q511–Q513 Q506–Q510 Q514 Q515 Q805–Q808 Q801–Q804 Q809–Q814
Diodes	D511 D501 D503 D505 D507 ZD201–ZD202 D509 D510 ZD803–ZD804 ZD801 D807–D808 D809 ZD802 D804–D806 D803 LD801

	B	C	E
Q501	–1.0	1.0	–1.5
Q503	0	–1.3	0
Q504	1.0	37.2	0.4
Q505	0	0.8	0
Q506	–1.0	–38.1	–0.5
Q507	0.4	37.2	0
Q508	0.4	37.2	0
Q509	–0.5	–38.1	0
Q510	–0.5	–38.1	0
Q511	0	12.2	0
Q512	0	12.2	0
Q513	12.2	0	12.2
Q514	–2.4	12.2	0
Q515	12.2	11.5	11.4
Q801	13.7	14.3	14.4
Q802	5.2	0	0
Q803	4.9	0	4.9
Q804	0	4.9	0
Q805	–0.2	0	0
Q806	–0.3	0	0
Q807	14.8	6.9	14.4
Q808	14.9	7.2	14.4
Q809	0	14.4	0
Q810	0	14.4	0
Q811	0	14.4	0
Q812	0	14.4	0
Q813	0	14.4	0
Q814	0	14.4	0

Voltage measuring conditions
Power Supply voltage 14.4V DC
Measuring instrument Digital Multimeter
Measuring point reference
With respect to the primary ground potential (POWER)
With respect to the secondary ground potential (AMPLIFIER)
Measuring conditions No signal input
Unit's load 4Ω
SW settings
Input selector to 0.5V position
Monaural mode selector to RIGHT + LEFT position



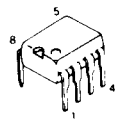
Packing Parts List

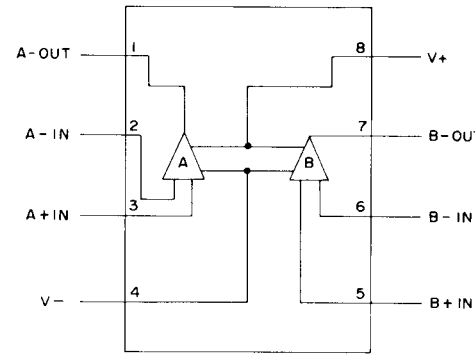
Symbol No.	Part No.	Description
	Packing Assembly Parts	
101	01V73700F05	Assembly, Kit Installation
□ 102	68P73333F05	Owners' manual
△ 102	68P73333F61	Owners' manual
□ 103	56S69254F53	Carton, Packing (Individual)
△ 103	56S69254F86	Carton, Packing (Individual)
104	56D70744F01	Tray, Packing "Front"
105	56D70744F02	Tray, Packing "Rear"
106	56B72811F02	Sack, Polyethylene
107	01T73201F01	Assembly, Kit Wire 2-pins (Speaker)
□ 108	01T74787F01	Assembly, Wire 6-pins
△ 108	01T71365F01	Assembly, Kit Wire 6-pins

□ : For North American Model only (AO)
△ : For General Foreign Model only (GO)
Others: common

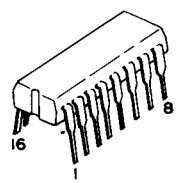
Semiconductors Leads Identifications

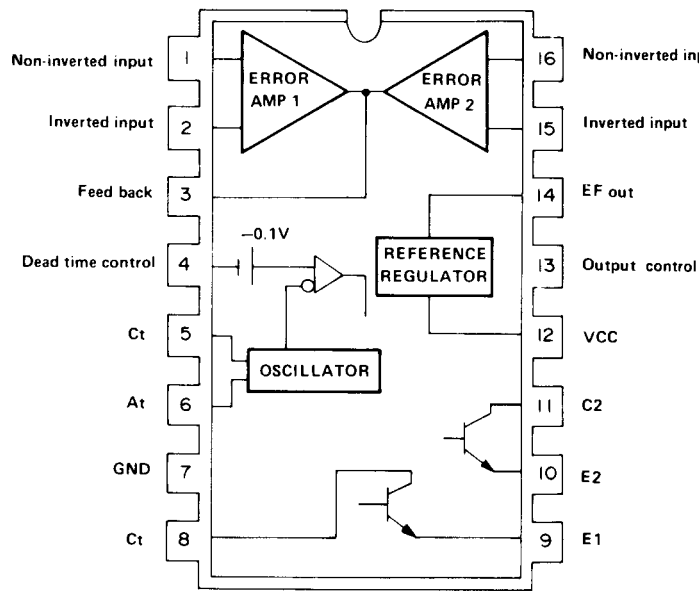
NJM2068D: IC201



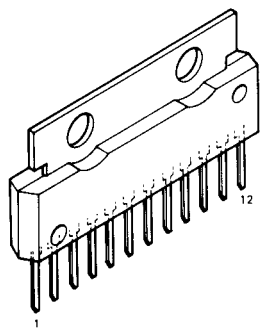


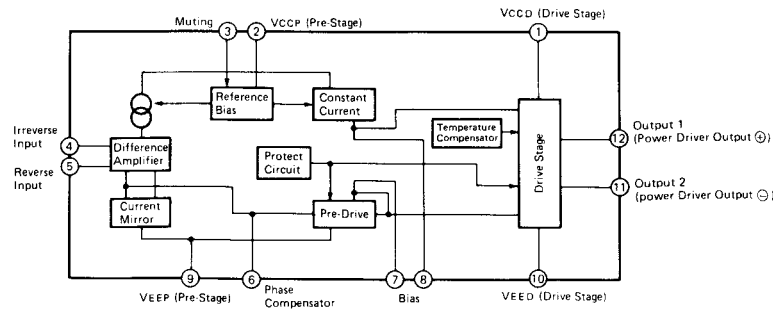
μPC494C: IC801
TL494CN



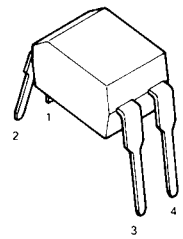


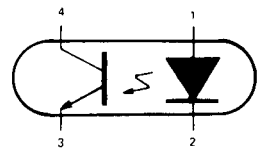
μPC1225H: IC501



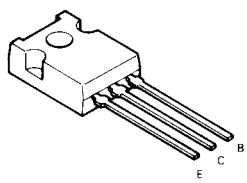


PC2401: PC802

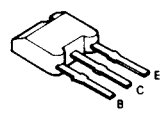


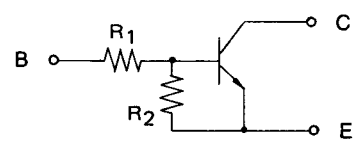


2SC3423: Q501
2SC3421: Q504
2SA1358: Q506, Q801

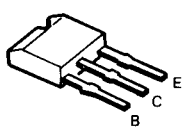


UN1211: Q802

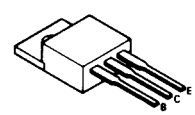




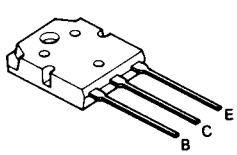
2SC2021: Q503, Q511, Q512, Q515, Q804, Q805, Q806
2SA937M: Q505, Q513, Q803, Q807, Q808
2SD1330: Q514



2SC1983: Q809, Q810



2SC3182: Q507, Q508
2SA1265: Q509, Q510



2SD1065: Q811–Q814